

Mid-thigh Arteriovenous Graft in Lower Extremity Vascular Access Construction for Hemodialysis Patients

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Patients who receive dialysis rely on vascular access. With advances in hemodialysis technique and dialysis service, the lifespan of patients has increased, but the sites of arteriovenous access in the upper extremities are exhausted after long-term use. In this situation, lower extremity arteriovenous graft is a popular choice by using the common femoral artery over the groin area. Unfortunately, the long-term patency rate is not satisfactory in lower extremity loop graft and there is a high infection rate. We investigated the feasibility of constructing arteriovenous access at the mid-thigh level when the upper extremity vessels are exhausted. [*Hong Kong J Nephrol* 2007;9(2):86–8]

Key words: arteriovenous access, arteriovenous graft, hemodialysis

血管通路的建立是血液透析療法的首要條件，隨著透析技術及服務的精進，病人的壽命已得到顯著的提升。上肢動靜脈通路會隨著長期的使用而失去功能，此時，利用鼠蹊部股總動脈以建立下肢動靜脈通路，是透析療法得以繼續進行的常用對策。然而，下肢動靜脈通路的長期可用性並不理想，且感染率偏高。本文探討了當上肢動靜脈通路失去功能後，在大腿中段重新建立血管通路的可行性。

INTRODUCTION

The prevalence of chronic renal failure is increasing in Hong Kong. Patients who receive dialysis therapy rely on vascular access. With advances in hemodialysis technique and dialysis service, the lifespan of patients has increased. However, the sites of arteriovenous access in the upper extremities are exhausted after long-term use. In this situation, lower extremity arteriovenous graft (AVG) is a popular choice by using the common femoral artery over the groin area. Unfortunately, the long-term patency rate is not satisfactory in lower extremity loop graft and there is a high infection rate. We investigated the feasibility of constructing arteriovenous access at the mid-thigh level when the upper extremity vessels are exhausted.

SURGICAL TECHNIQUE

The procedure is performed under general anesthesia. The patient is positioned supine and draped from groin

down to the knee (Figure 1). Preparation of the groin area is included so that an arteriovenous loop graft can be constructed in the same session if the superficial femoral artery or vein is not suitable for access creation. The thigh is laterally rotated. An incision is made over the inner thigh medial to the sartorius muscle at the mid-thigh level (Figure 2). The landmark of the sartorius



Figure 1. Preparation of the thigh up to the groin area.

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muscle is from the anterior superior iliac spine to the medial condyle of the femur. After skin incision, the sartorius muscle is retracted laterally and the deep fascia of the thigh is exposed. Pulsation from the superficial femoral artery is palpable and direct to the deeper dissection. After the superficial femoral artery and vein are identified and dissected free from surroundings, 6 mm or larger polytetrafluoroethylene graft is inserted through the subcutaneous tunnel placed above the knee. If the superficial femoral artery lies beneath the sartorius muscle, the graft is tunneled beneath the muscle after the lateral border of the sartorius is mobilized (Figure 3). 6-0 prolene or Gore-Tex stitches are used for anastomosis (Figure 4). Hemostasis is ascertained. The wound is closed in layers with no drain insertion. The patient can resume diet after operation and be discharged 1 day after the procedure (Figure 5). The stitches can be removed on days 10–14 after the operation.

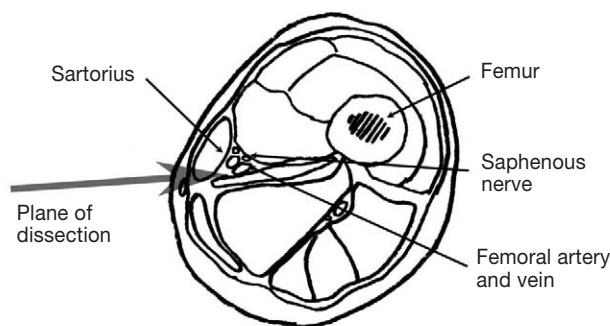


Figure 2. Cross-section at the mid-thigh level.

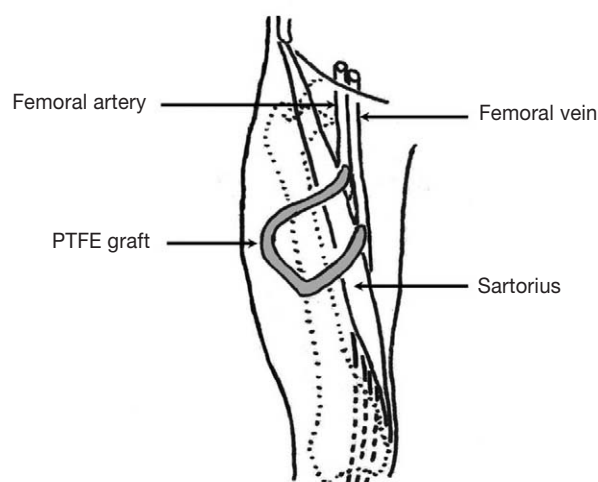


Figure 3. Anatomical landmarks and the site of graft placement. PTFE = polytetrafluoroethylene.

PRELIMINARY RESULTS

Between February 2007 and May 2007, three patients underwent construction of mid-thigh AVG in the Prince of Wales Hospital.

Case 1

This 70-year-old woman had exhausted all the upper extremity vascular accesses. Mid-thigh loop AVG was created. The procedure was uneventful. She was discharged 1 day after the operation and received hemodialysis from the graft 8 weeks after operation.

Case 2

This 50-year-old man had superior vena cava obstruction. Creation of a mid-thigh loop AVG was attempted. However, the superficial femoral artery was found to be heavily calcified and not suitable for vascular access. A separate incision was made over the

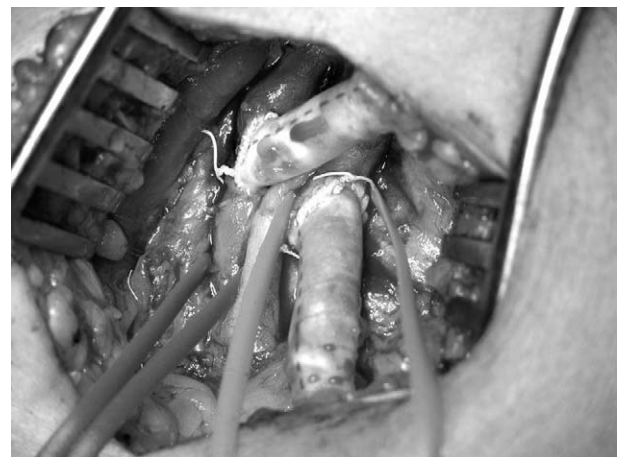


Figure 4. Anastomosis.



Figure 5. Wound after construction of mid-thigh arteriovenous graft.

groin in the same operating session for construction of loop AVG by using the common femoral artery. The patient subsequently received hemodialysis through the groin AVG.

Case 3

This 53-year-old man had exhausted all the upper extremity vessels for dialysis access. Mid-thigh arteriovenous fistula between the superficial femoral artery and long saphenous vein was performed. Strong thrill was readily palpable after operation and the patient was discharged the next day.

DISCUSSION

The prevalence of chronic kidney disease and end-stage renal failure is on the rise in Hong Kong and worldwide. The demand for peritoneal dialysis and hemodialysis is increasing as a result. Because of the low rate of kidney donation, patients may need to rely on dialysis therapy for an extended period of time. The maintenance and long-term patency of dialysis access thus becomes a crucial factor. Vascular access failure is one of the most common problems encountered by nephrologists and surgeons. After years of repeated puncture of fistulae or grafts, the upper extremity vessels may be exhausted. Subsequently, patients will need to undergo the construction of vascular access from sites other than the upper limbs.

From the literature, the primary and secondary patency rate of femoral AVG over the groin area ranges from 34% to 62% and from 41% to 83%, respectively, at 1 year [1–4]. Infection is one of the major concerns with regard to lower extremity vascular access. The reported infection rate is up to 46% [3]. In view of the high infection rate and unsatisfactory long-term patency rate, vascular access creation with a mid-thigh approach is an attractive alternative. The first series of mid-thigh loop AVG creation was reported in 2003 by Flarup and Hadimeri [5]. Between October 1992 and March 1997, they performed 14 grafts. The primary and secondary patency rates at 1 year were 54% and 64%, respectively. In three patients, the grafts were removed due to infection, pseudoaneurysm and bleeding. Scott et al reported 1-year primary and secondary patency rates of 40% and 68%, respectively, and an infection rate of 21% [6].

The anatomical landmark at the mid-thigh is easily recognizable and the superficial femoral artery and vein are readily identified. Access to the superficial femoral artery is easier than to the common femoral artery at

the groin level. Dissection of lymphatic tissues is not necessary over the mid-thigh level, which in turn decreases the risk of lymphocele formation. We do not perform any preoperative imaging to look for artery calcification. If the superficial femoral artery is calcified or in a condition that renders graft creation not possible, as in case 2 of our series, then the common femoral artery and vein over the groin area are always available as second choice during operation. It is an advantage for the surgeon to be able to complete graft creation in the same operation session if difficulties are encountered over the mid-thigh area. As the locations of incision and the graft are away from skin crease, puncture of the potential contaminated site over the groin is avoided. Furthermore, the graft over the mid-thigh is more accessible to staff in the renal dialysis unit. As the common femoral artery and vein are preserved, they can be used in the future if the mid-thigh graft fails.

In summary, the advantages of AVG creation at the mid-thigh level over the groin are: technically easier; creation of vascular access at a cleaner site means lower rate of infective complications; easily accessible to staff in dialysis units; a more proximal site, i.e. common femoral artery at groin, is preserved for future use if the mid-thigh graft fails.

Mid-thigh loop AVG creation may be considered the first choice in patients who have exhausted all their upper extremity vascular accesses. Further investigation of the long-term results of mid-thigh grafts is necessary.

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